# Subaqueous Soils: Interpretations Committee and SAS Working Group

**Michael Wilson,**
**NRCS, Lincoln, NE**
**reporting**
**for the 32+ members**

# Working Group Charges

**Review and document progress from 2008 regional conferences on subaqueous soils.**

**Institutionalize methodologies for sample handling protocols and characterization methods for critical data elements.**

**How might studies of regional or local hydrology apply to mapping and updating freshwater subaqueous soil survey information?**

**Document progress of subaqueous soils research in soil survey and applications to interpretations.**

# Why the Interest Subaqueous Soils?

- Soil and Water

- 75% of the population will live within 25 miles of the coast

- Who better to inventory the resources than the NCSS?

# Value of Seagrass in Florida

- 1 acre of seagrass can produce > 10 tons of leaves/yr
- Provides food, habitat, and nursery areas for adult and juvenile vertebrates and invertebrates
- 1acre may support 40,000 fish and 50M small invertebrates
- Very good environmental quality indicator
- Producer of as much as 5840 g C/$m^2$

# Value of Seagrass in Florida

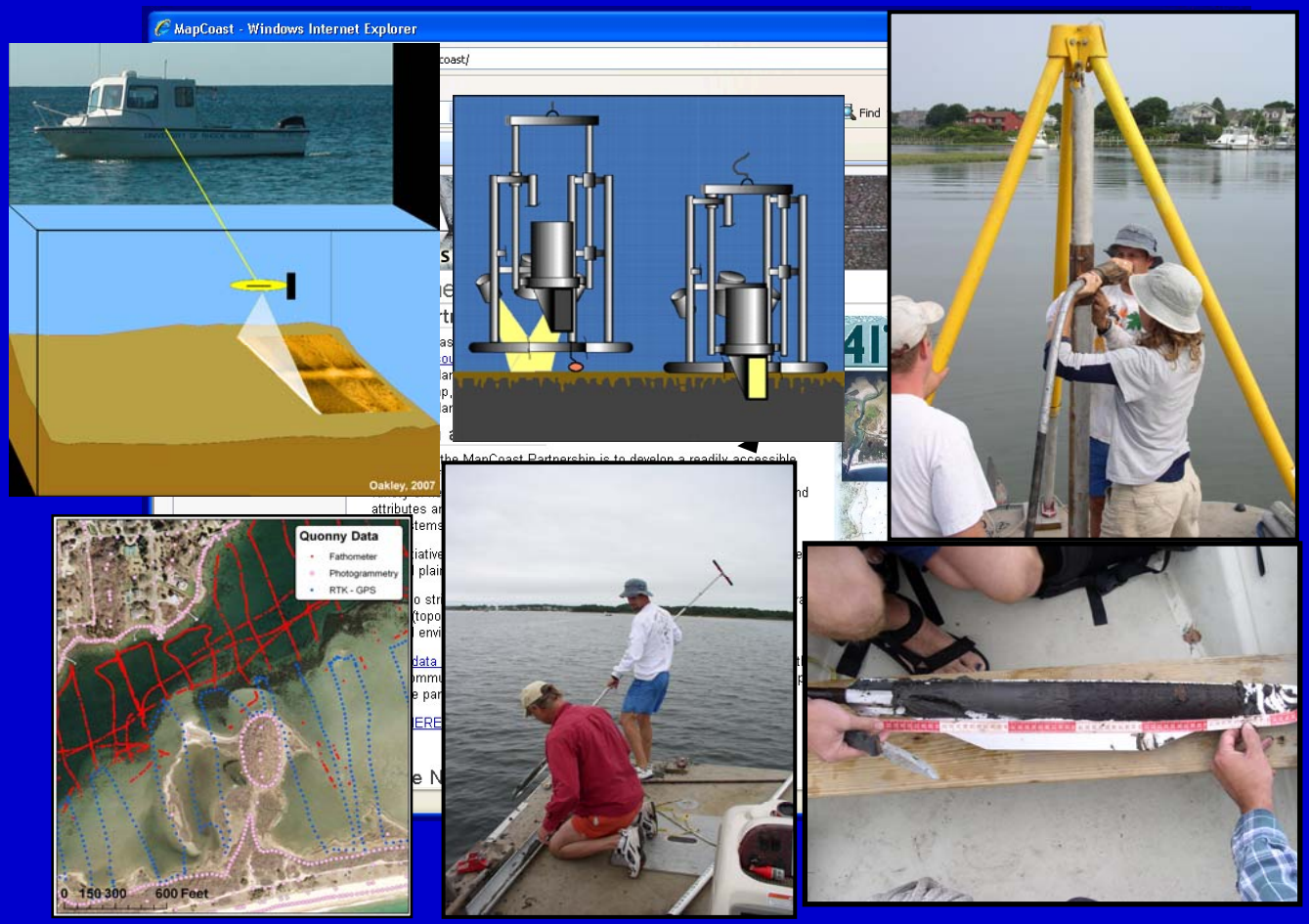
- Approximately 2.7 M acres of seagrass supports commercial and recreational fisheries
- Commercial harvest of fish and shellfish is valued at >$124B
- 1 acre has an economic value of $20.5K
- Direct annual economic benefit of seagrass is ~$55.4B

# Coastal Resource Managers See Potential in Extending Soil Survey to Estuarine Environments.

For Example: MapCoast Project
Rhode Island, USA


*"A consortium dedicated to multidisciplinary mapping of coastal underwater resources, including bathymetry, habitat, geology, soils/sediment, and archeological resources in shallow waters."*

# MapCoast Partnership




- Interdisciplinary group of researchers
- Publish Interactive maps on-line

www.mapcoast.org


**nportant for success:**

**entify need and expand terest to other area of S; saline as well fresh ater**

**Recent and Current Subaqueous Soil Investigations**

# What work has been accomplished ?

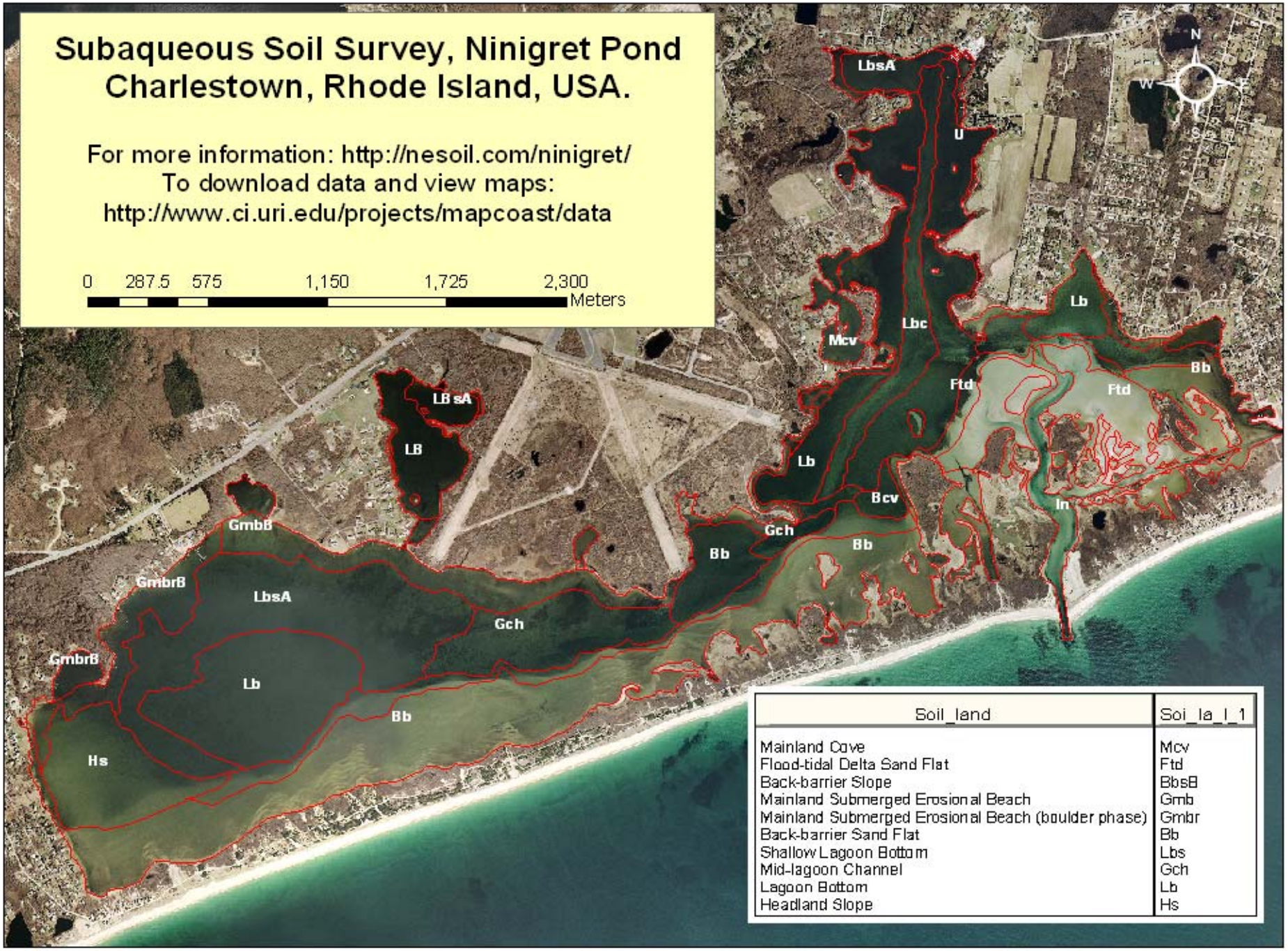
**Completed survey areas:**

**Little Narragansett Bay,**
**Ninigret Pond,**
**Quonny Pond,**
**Sinipuxent Bay,**
**Chincoteague Bay,**
**Taunton Bay,**
**Delaware Bay,**
**Point Judith Pond,**
**Cedar Key**
**Pacific Island Areas (5 soil surveys that have SAS identified)**

# Subaqueous Soil Survey, Ninigret Pond
# Charlestown, Rhode Island, USA.

For more information: http://nesoil.com/ninigret/
To download data and view maps:
http://www.ci.uri.edu/projects/mapcoast/data

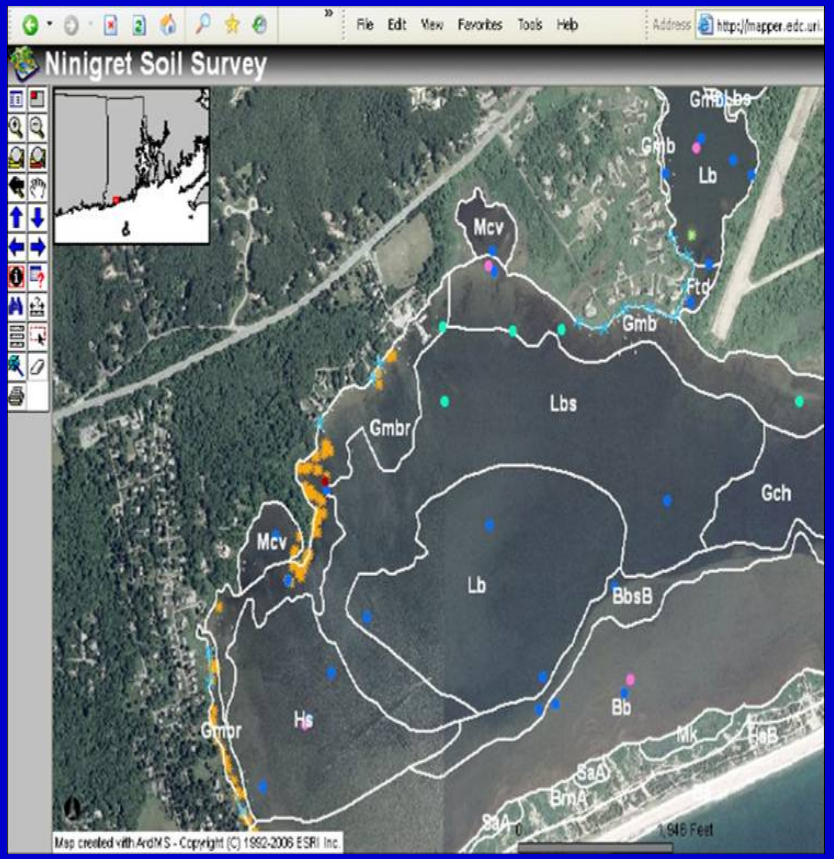
0 287.5 575 1,150 1,725 2,300
Meters




| Soil_land | Soi_la_l_1 |
|---|---|
| Mainland Cove | Mcv |
| Flood-tidal Delta Sand Flat | Ftd |
| Back-barrier Slope | BbsB |
| Mainland Submerged Erosional Beach | Gmb |
| Mainland Submerged Erosional Beach (boulder phase) | Gmbr |
| Back-barrier Sand Flat | Bb |
| Shallow Lagoon Bottom | Lbs |
| Mid-lagoon Channel | Gch |
| Lagoon Bottom | Lb |
| Headland Slope | Hs |

# Ninigret Pond Landforms and Soils Bradley and Stolt, 2003

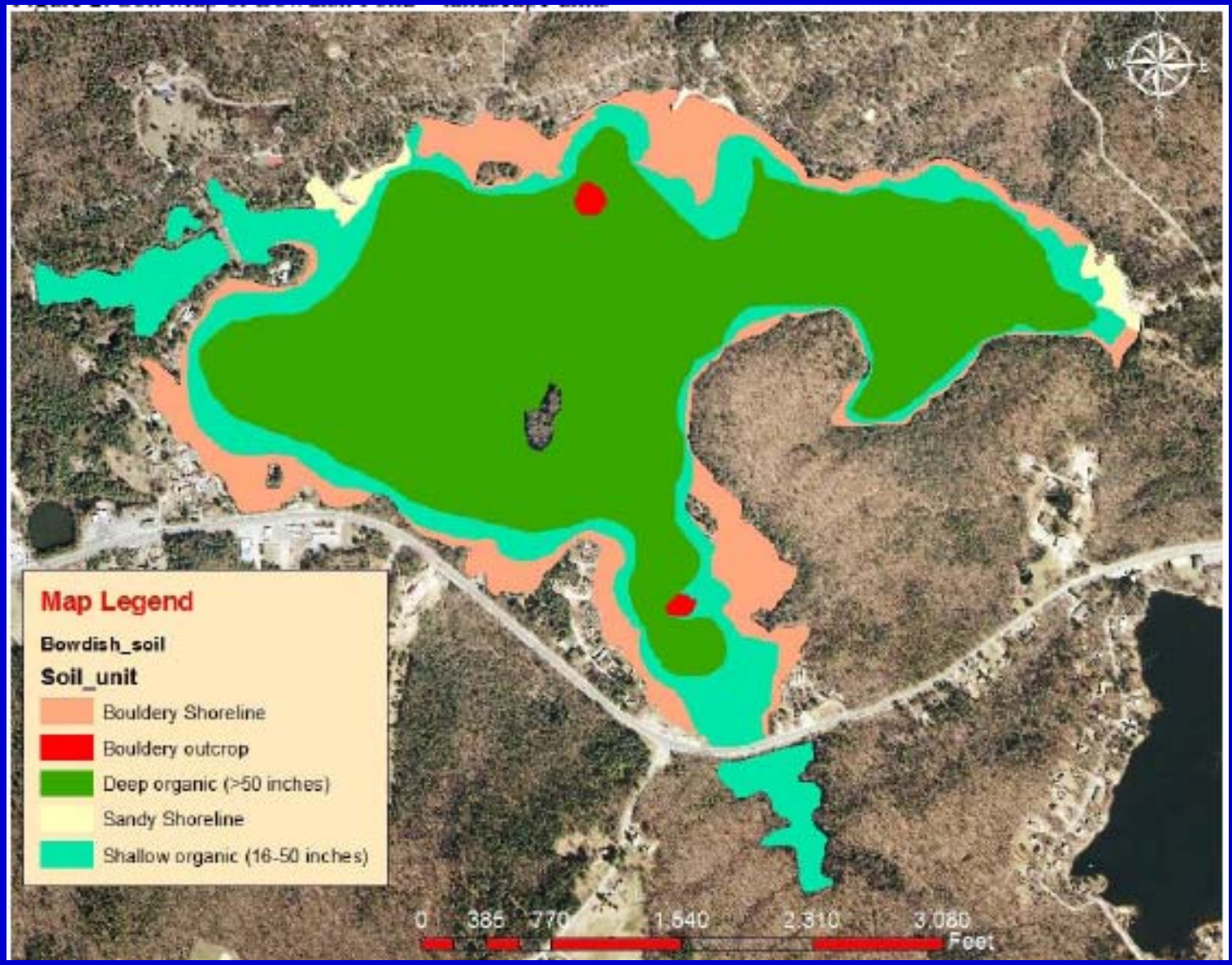
- **Lagoon Bottom**
  - Typic Hydraquents
- **Storm-surge washover fan flat**
  - Typic Sulfaquents
- **Flood-tidal Delta**
  - Typic Psammaquents
- **Mainland Cove**
  - Thapto-histic Hydraquents



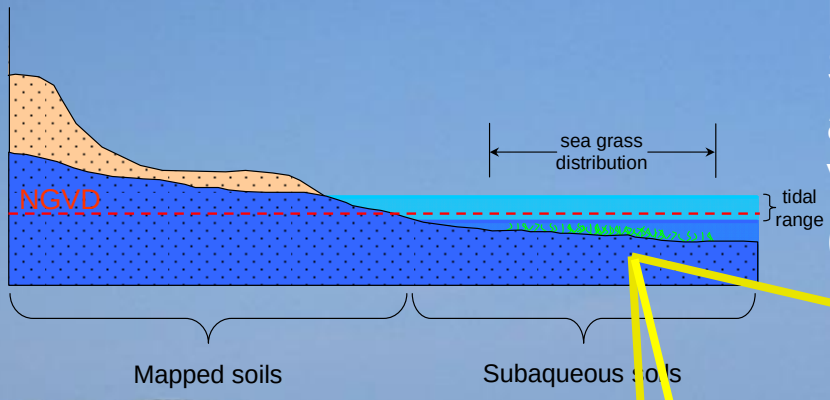
## Fresh Water Mapping

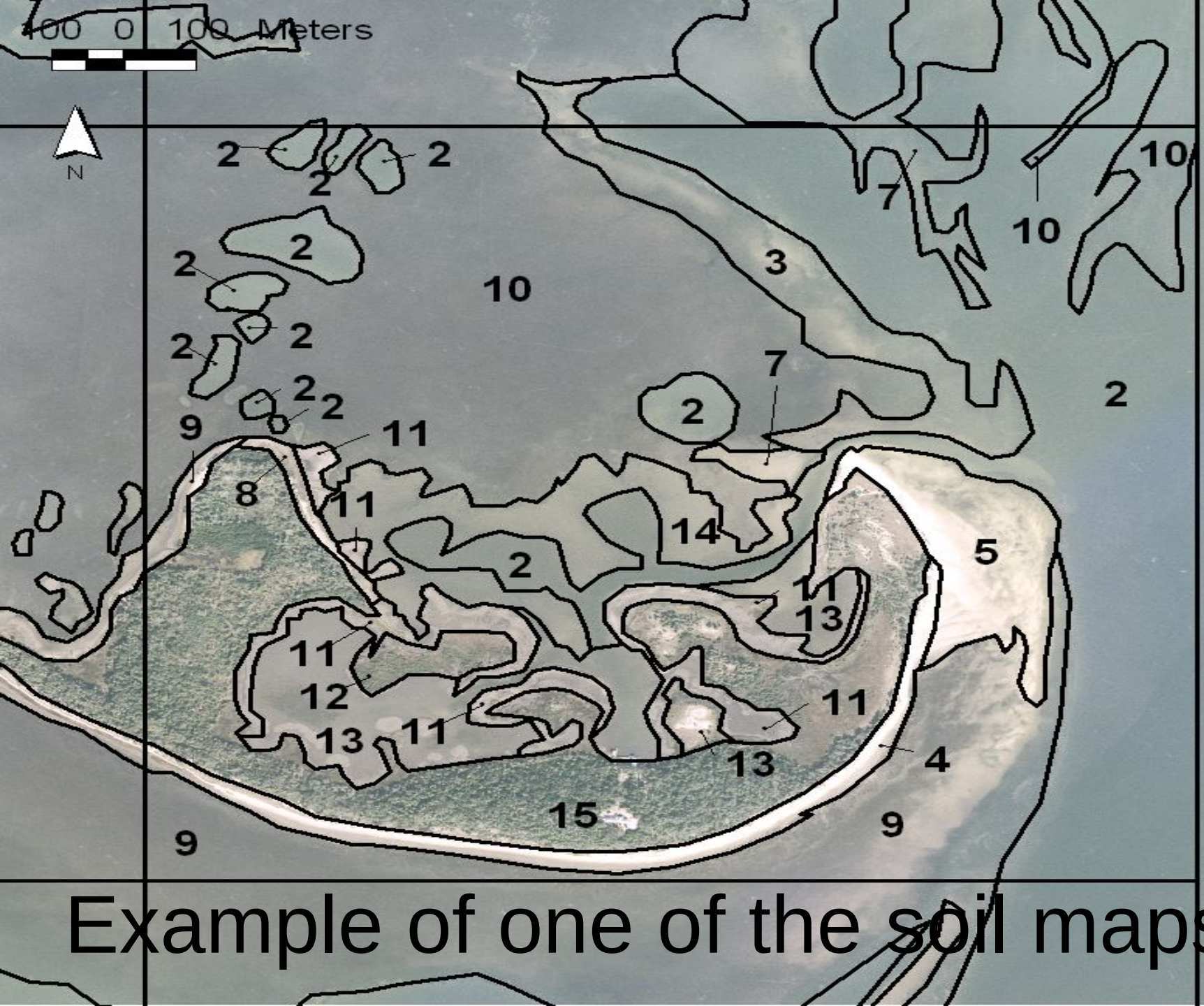
# Subaqueous Soil Survey of Bowdish Reservior – Gloucester, RI


Invasive species management, habitat restoration


Map Legend
Bowdish_soil
Soil_unit
Bouldery Shoreline
Bouldery outcrop
Deep organic (>50 inches)
Sandy Shoreline
Shallow organic (16-50 inches)
0
385
770
1,540
2,310
3,080
Feet

# Methodology to Determine the Attributes of Subaqueous Soils as Related to Existing and Potential Submerged Aquatic Vegetation
(Ellis PhD study, 2006)



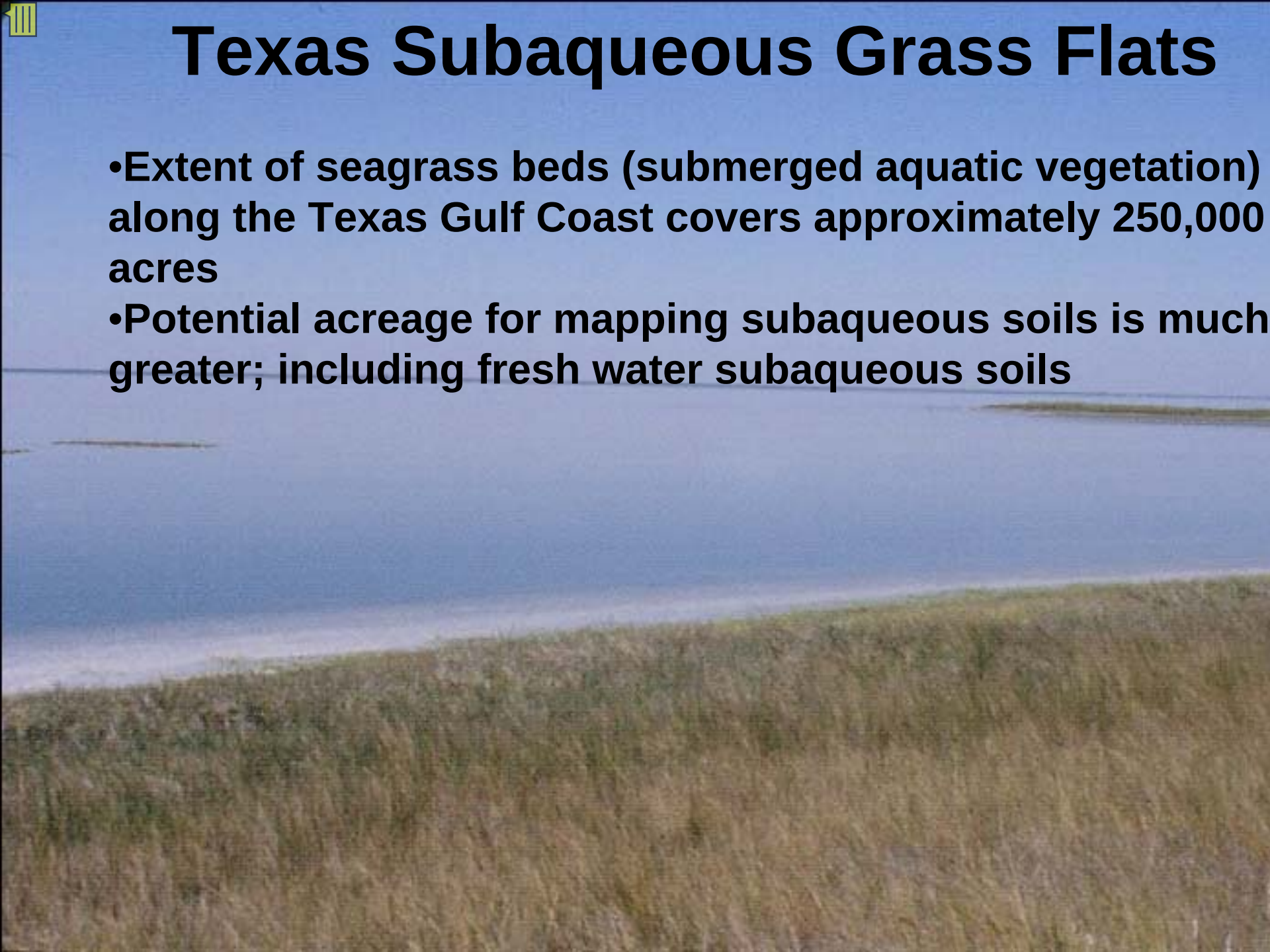




Example of one of the soil maps

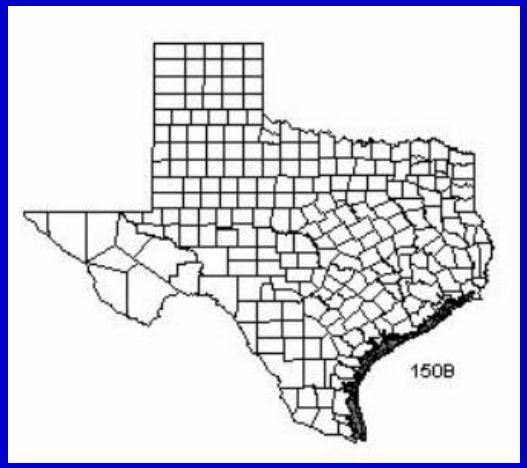
| MUID | Landscape Unit | Current USDA Classification |
|---|---|---|
| 1 | Erosional Unvegetated Flat / Near Channel Bar Complex | Sandy, siliceous, hyperthermic Typic Psammaquents |
| 2 | Deep Water | Non-soil |
| 3 | Edge of Channel Bar | Sandy, siliceous, hyperthermic Typic Psammaquents |
| 4 | Erosional Beach | Sandy, siliceous, hyperthermic Typic Fluvaquents |
| 5 | Erosional Unvegetated Flat | Sandy, siliceous, hyperthermic Fluvaquentic Endoaquolls |
| 7 | Near Bar Grassflat | Sandy, siliceous, hyperthermic, Typic Psammaquents |
| 8 | Drownded Flatwoods | Sandy, siliceous, hyperthermic Typic Endoaquolls |
| 9 | Near Shore Grassflat | Sandy, siliceous, hyperthermic Typic Psammaquents |
| 10 | Offshore Grassflat | Sandy, siliceous, hypterthermic Typic Endoaquolls |
| 11 | Oyster Bar | Sandy, siliceous, hypterthermic Typic Endoaquolls |
| 12 | Saltmarsh | Sandy or sandy-skelatal, siliceous, euic, hyperthermic Terric Sulfihemists |
| 13 | Saltmarsh Flat | Loamy, siliceous, hyperthermic Sulfic Hydraquents |
| 14 | Unvegetated Flat | Siliceous, hyperthermic, Typic Psammaquents |
| 15 | Uplands | Misc. Entisols and Spodosols |

# Texas Subaqueous Grass Flats

- Extent of seagrass beds (submerged aquatic vegetation) along the Texas Gulf Coast covers approximately 250,000 acres
- Potential acreage for mapping subaqueous soils is much greater; including fresh water subaqueous soils



# Ecological Site Descriptions (ESD) and database




**June 2009:**
**Seagrass Conservation Workshop**

**The Grazing Lands Team has developed (for Texas) approved ESD for tidal soils, the Arrada, Barrada, Tatton, and Satatton series**

**A draft ESD for a subaqueous soil, Baffin series (Subaqueous Grass Flat)**

**Their approach is potentially applicable nationwide.**

# Glossary terms added

- A total of 66 terms were referenced or defined to describe subaqueous and adjacent subaerial environments and landforms
- 29 terms exclusively used for subaqueous soils added to the NSSH

NRCS

GLOSSARY OF TERMS FOR SUBAQUEOUS SOILS, LANDSCAPES, LANDFORMS, AND PARENT MATERIALS OF ESTUARIES AND LAGOONS

Subaqueous Soils Subcommittee
of the
Standing Committee on NCSS Standards
National Cooperative Soil Survey Conference
Corpus Christi, Texas
2005



September 2005

# Amendments to Soil Taxonomy

- To be published in next edition of KST (2009)
- Amendments at suborder, great group, and subgroup level of Entisols and Histisols
- Defined as having a positive matrix potential at the soil surface for at least 21 hours of every day
- Suborders are Wassents and Wassists

# Amendments to NASIS and Pedon PC

- Subaqueous drainage class
- Manner of Failure (n-values)
- Oxidized pH
- Use of multiple primes
  - A, C, Ab, C’, A’b, C’’, A’’b, C’’’

# Official Series Descriptions

- **PISHAGQUA SERIES MLRA: 144A**
  - **The Pishagqua series consists of very deep, subaquic soils that are permanently submerged in low energy depositional basins, estuaries and coastal lagoons. The Pishagqua soils formed in silty estuarine deposits.**
- **SOUTHPOINT SERIES MLRA(s): 153C, 153D**
  - **Southpoint sand on a smooth 0.5 percent slope in a deep mainland cove under 4.2 feet of permanent estuarine water.**
- **BAFFIN SERIES MLRA: 150B in LRR T**
  - **The Baffin series consists of very deep, very poorly drained (permanently submersed) soils that formed in slightly fluid sandy and loamy estuarine sediments. These nearly level soils are in shallow-water grass flats of bays and lagoons. Water depth is generally less than 1.2 meters (4 ft).**

# WORKGROUP RECOMMENDATIONS

**Maintain working group and evolve into/formalize a national committee on SAS.**

# WORKGROUP RECOMMENDATIONS

**Develop SAS informational primer, tech notes, information sheets to explain concepts and create understanding of the purpose, mechanisms, and products.**

**Methods Manual to map and characterize SAS properties – into SSM, NSSH, and into separate document.**

# WORKGROUP RECOMMENDATIONS

**SAS Workshop – to help standardize techniques/methodology—teach principals applicable to various regions and SAS-types.**

# Logistical Considerations

# Sampling Issues

- **Hand Tools**
  - **Dutch auger, peat sampler, push tube, etc.**
    - **Relocate hole**
    - **Strong suction**
- **Vibracore**
  - **Aluminum tubes**
  - **1 use (cut open)**
  - **Storage**
- **Limited Space**

# WORKGROUP RECOMMENDATIONS

**Ecological Site Descriptions –create small working group with ESD and SAS personnel to explore the possibility of merging ESD concepts into SAS. This concept will expand beyond plants into all ecological components.**

**Hire ecologist to help identify vegetative and benthic communities in coastal environments.**

# WORKGROUP RECOMMENDATIONS

**SUURGO certification of products and posting on Web Soil Survey and Soil Data Mart: Coastal Lagoons of Washington Co., RI and Little Narragansett Bay, RI and CT**

# WORKGROUP RECOMMENDATIONS

## Interpretations

List and prioritize

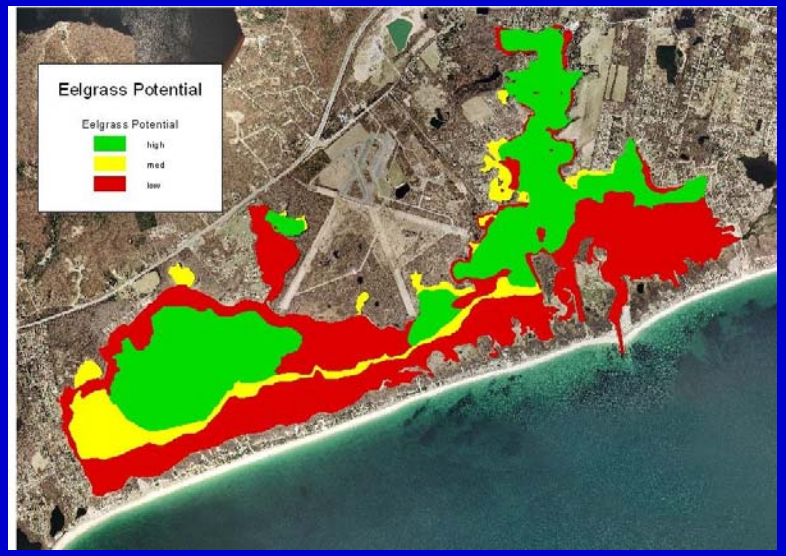
Document work completed to date and finalize interpretations those interpretations.

# POSSIBLE INTERPRETATIONS TO DEVELOP

SAV Restoration
Crab Habitat
Aquaculture/shellfish restoration
Management for Sustainable Production - Shellfish
Nutrient Reduction/Health/Water Quality
Benthic Preservation Site Identification
Wildlife Management
Critical Habitats for Wading Shore Birds
Nurseries and Spawning areas
Habitat Protection for Horseshoe Crabs
Dredging Island Creation
Tidal Marsh Protection and Creation
Navigational Channel Creation/ Maintenance
Effects of Dredging on Benthic Ecology
Off Site Disposal of Dredge Spoil
Acid-Sulfate Weathering Hazards
Accretion rates.
Heavy metals/Health Issues.
Habitat Mapping
Impacts on Sea-level rise
Survival of seagrass
Risk/susceptibility of invasive species (e.g., milfoil)
Herbicides use and movement

# Restoring Submerged Aquatic Vegetation (SAV)

- Grasslands of the oceans.
- Highly productive ecosystems
- Losses are a concern.
- Bradley & Stolt, 2006
  - Eelgrass affected by
    - Texture
    - Salinity
    - Acid-volatile sulfides
  - Restoration can benefit by targeting appropriate soil-landscape units.



# Boat Moorings Suitability
## (Surabian, 2007)

- Two styles of anchor
  - Mushroom
    - Best on soft bottom
      - High n-value
  - Dead weight
    - Best on hard bottom
      - Low n-value
  - Economic benefit
    - Boat owners
    - Insurance companies

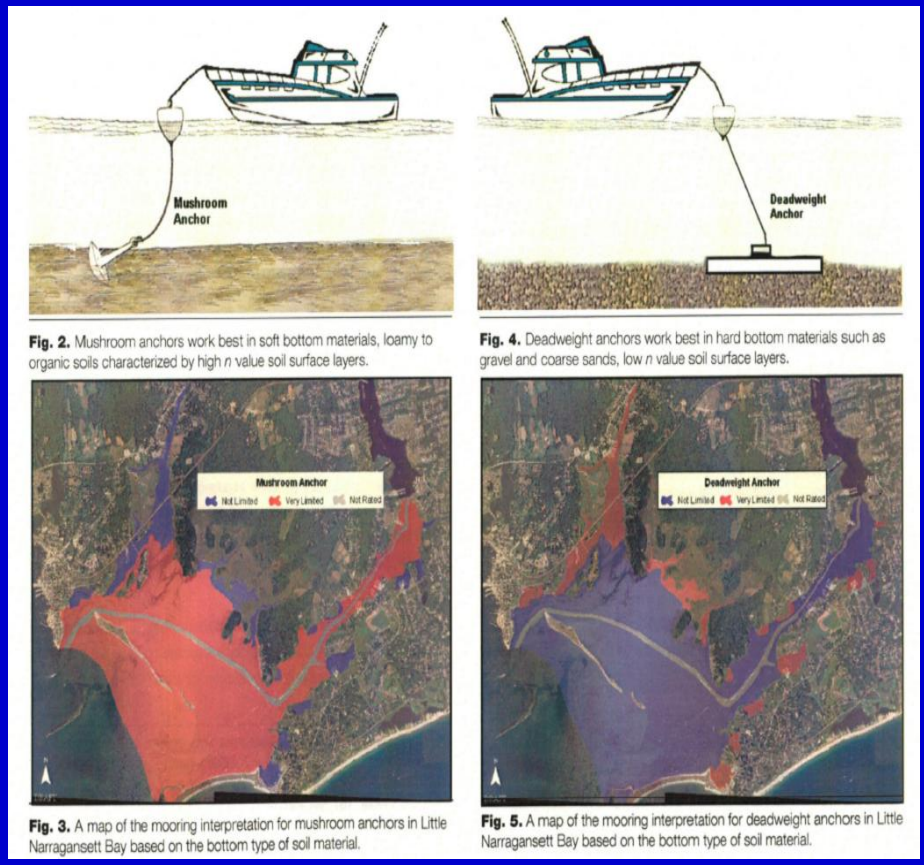



**Fig. 2.** Mushroom anchors work best in soft bottom materials, loamy to organic soils characterized by high *n* value soil surface layers.

**Fig. 4.** Deadweight anchors work best in hard bottom materials such as gravel and coarse sands, low *n* value soil surface layers.

**Fig. 3.** A map of the mooring interpretation for mushroom anchors in Little Narragansett Bay based on the bottom type of soil material.

**Fig. 5.** A map of the mooring interpretation for deadweight anchors in Little Narragansett Bay based on the bottom type of soil material.

# Acid-Sulfate Materials

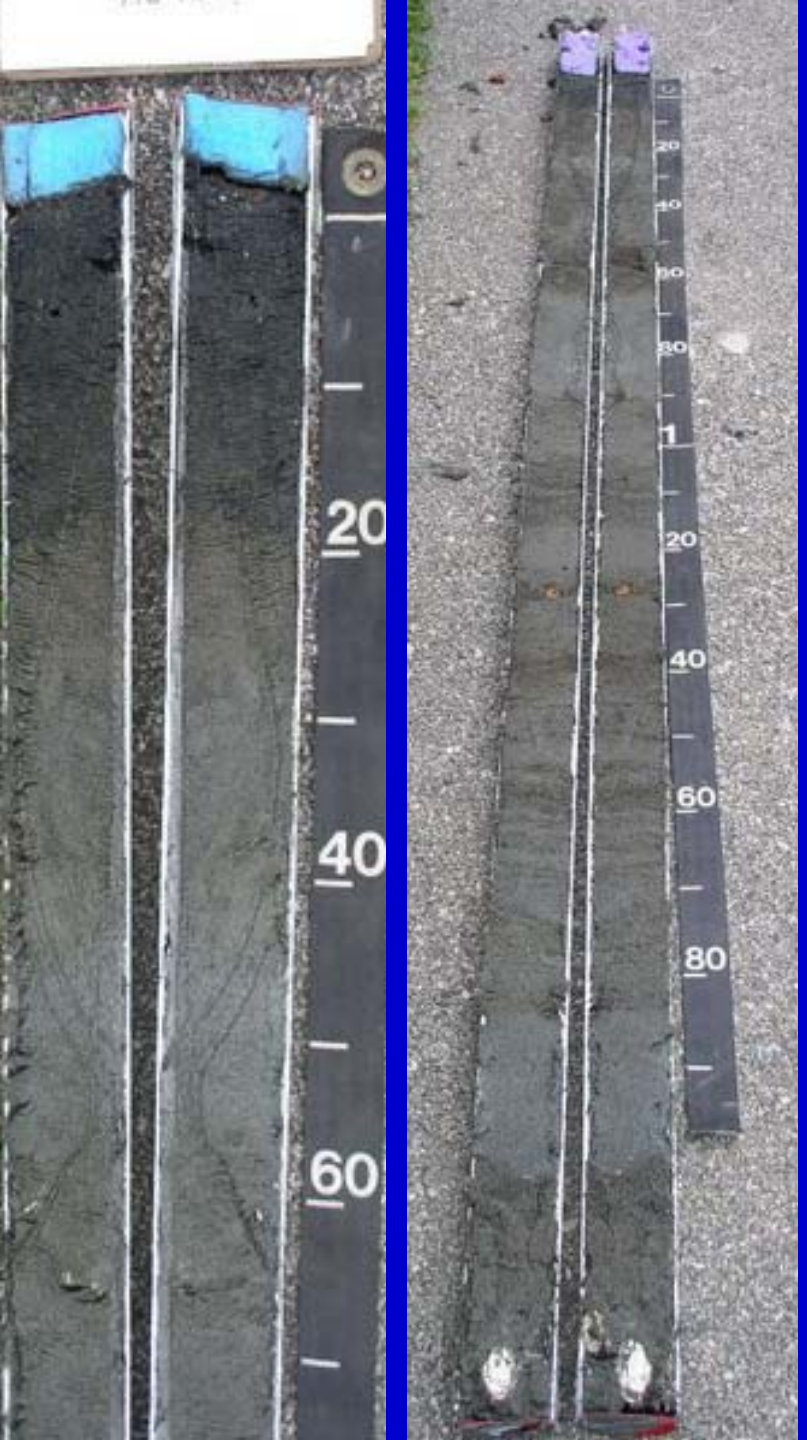
- **Dredge Materials**
  - **Acid producing upon oxidation.**


# WORKGROUP RECOMMENDATIONS

## NASIS:

**Populate SAS datafields when available in next NASIS version**

**Write interpretation scripts for properties such as of oxidized pH (presence of sulfidic materials), bottom type (moorings)**


20
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Marine silts
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